ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF COMMERCIAL FISHERIES

1994 SOUTHERN DISTRICT (KACHEMAK BAY) DUNGENESS CRAB POT SURVEYS

by
Al Kimker

Regional Information Report No. 2A94-38

Alaska Department of Fish and Game
Division of Commercial Fisheries
333 Raspberry Road
Anchorage, Alaska 99518-1599

November 1994

---

[1] Contribution from the Homer area office. The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this informational may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the author or the Division of Commercial Fisheries.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICIES

INTRODUCTION

The majority of the commercial harvest of Dungeness crabs (Cancer magister) in the Cook Inlet Management Area has come from the Southern District, which includes Kachemak Bay (Figure 1). Results of the 1989 and 1990 commercial fisheries indicated that the Dungeness stock was in a depressed condition. The 29,000 pound catch in 1990 was 3 percent of the one million pound average harvest from the years 1978-1990 (Table 1). In a demonstration of concern for the stock condition, the 1990 Board of Fisheries directed the department to improve assessment of Dungeness crabs other than collecting Dungeness bycatch data from the king and Tanner crab trawl survey. The Board also made the initial inroads into conservative regulation of the Cook Inlet Dungeness fishery.

In 1990, as a result of Board direction, the department began a pot survey for Dungeness crabs in Kachemak Bay. Since its inception the primary survey goal has evolved from an assessment of softshell incidence to an index of abundance. A summary of the current objectives is as follows:

1) Identify the annual timing of the molt, or molts, of catchable Dungeness crabs, both male and female.

2) Document the percentage of soft-shell Dungeness crabs.

3) Document the sex, size and shellage of all Dungeness crabs and the egg condition of all female Dungeness crabs.

4) Establish an index of abundance of Dungeness crabs.

5) Document the incidental catch of king and Tanner crabs.

6) Document the difference in catch between pots with escape rings open and pots with escape rings closed.

Data from the department crab trawl surveys have also proven useful in describing the Dungeness stock. The crab trawl surveys in Cook Inlet began in 1989, but were not fully implemented until 1990. The primary goal of the trawl survey was to assess Tanner (Chionoecetes bairdi) and red king crab (Paralithodes camtschaticus) stocks. Ancillary information, such as Dungeness catch, was documented. The initial survey design did not focus on Dungeness, because during likely survey months, June - August (post Tanner and king molt), a portion of the Dungeness stock would not be available to the gear, i.e., they were in waters too shallow to sample with a trawl. Dungeness data presented in this report will allow comparison to the pot survey catches that sample the crabs in shallow water.

METHODS

In 1994 the State chartered the F\V Lion of Judah for the entire survey. Standard Dungeness pots of two distinct weights were used for the survey: pots used east and west of Homer Spit were 60 and 100 pounds, respectively. The gear dimensions reflected those generally used by commercial fishermen. Bait types used were squid and razor clams, east and west of Homer Spit, respectively. These bait types also reflect those commonly used by commercial fishermen. Initial soak time goals were 24 hours east of the Spit and 48 hours west of the Spit. The variation in soak times was the result of both fishermen comments regarding the time necessary for the pots to begin fishing and cost of the charter.

All commercial Dungeness gear are required by regulation to have two 4 3/8 inch diameter circular escape rings. The intent of the

escape ring regulation is to permit the egress of female and sublegal male crabs from the pot thereby reducing the incidence of handling of these non-target crabs. The escape rings were left open on two-thirds of the survey gear in order to approximate the catches of commercial fishermen. Every third pot, or one-third of the gear, was fished with the escape rings closed. This was done

in order to determine the relative magnitude of small crabs that these pots were capable of capturing and retaining.

Selection of survey stations was systematic. Commercial fishermen were interviewed in order to determine specific locations for crab capture given the time of year the survey was to occur. A total of 170 stations were selected, 90 east (Appendix A) and 80 west of Homer Spit (Appendix B).

The time span of the respective surveys within the year was based on fishermen input, historical catch figures, suspected and known molt timing of catchable males, and available funding for the project.

The gear was set east of Homer Spit in three 15 pot strings in the Mud Bay area and 15 three pot springs in the upper bay (Figure 2). Eight 10 pot strings were fished west of Homer Spit (Figure 3). Distance between individual pots within a string was approximately 0.25 nautical miles east of Homer Spit and 0.20 nautical miles west of the Spit.

A Global Positioning System, video plotter and echo sounder were used to record pot and station information for future reference and replication. Depths were recorded at the time the gear was set utilizing the vessel's sounder. Documented depths do not take into consideration the stage of the tide.

Once each pot was pulled, all Dungeness, king and male Tanner crabs were measured to the nearest millimeter (mm) of carapace width (Dungeness and Tanner) or length (king) and shellaged. Relative fecundity of all Dungeness and king crab females was determined. Juvenile female Dungeness were not identified since positive classification would have required destroying the animal. Female Tanners were counted only.

Speed was often essential while pulling the pots. Shallow sets coupled with running tides and currents made it necessary to move through the gear with maximum efficiency in order to retrieve all the pots either before the water became too shallow for the vessel or the current pulled the buoys under. In some instances therefore the bycatch species were sampled only to species, count and sex.

RESULTS

East of Homer Spit

The dates for the four surveys east of Homer Spit were: May 23 - 25, June 21 - 23, July 19 - 21 and Aug. 22 - 24. Ninety pots were lifted in three of the four surveys east of the Spit; 88 lifts were made during the last survey in August. Fishing depths ranged from 0.7 to 10.3 fathoms, averaging 3.8 fathoms. Average soaks varied from 21 to 26 hours with a mean of 23 hours (Table 2).

Similar to past years, overall numbers of male crabs increased as the survey season progressed, beginning at 16 crabs in May and peaking in August at 177 (Figure 4). Females catch was less, starting at 18 in May, peaking at 119 in June and dropping to 37 by August. Male soft-shell numbers were never substantial with a

total of 4 soft males captured during the four separate monthly surveys (Table 3).

The monthly increase was equally evident for both new-shell and old-shell males (Figures 5 and 6). The new-shell male portion of the catch increased from 6 percent in the May survey to a high of 59 percent in the August survey. The new shell increase was apparent for legals as well as sublegals (Table 4).

The size range of males was 100 to 197 mm carapace width with a mean of 168 mm. There were no significant changes in the average sizes among surveys. The range of sizes varied, but only three small crabs created this difference (Table 5).

No females were ovigerous. The size range of females was 72 to 181 mm carapace width with an average of 145 mm. Only 3 of the females were in a soft-shell condition (Table 6).

No Tanner or king crabs were caught (Table 7).

West of Homer Spit

The two surveys west of the Spit were July 12 - 14 and August 16 - 18. Seventy and 77 pots were pulled west of the Spit in July and August, respectively. Ten pots were lost in July and three in August (lost pots were found after the survey). Fishing depths ranged from 15.0 to 46.0 fathoms, averaging 29 fathoms. Mean soak times were 49 hours for the July survey and 48 hours for the August survey (Table 2).

The July survey west of Homer Spit resulted in a catch of 3 males and 17 females. All of the males were legal. None were in a soft-shell condition (Table 3). The males were all old shells (Table

4). Size ranged from 166 to 173 mm with an average of 169 mm (Table 5). None of the 17 females were either ovigerous or soft-shelled (Table 6).

The survey conducted in August resulted in a catch of 11 males, 8 legals and 3 sublegals, as well as 13 females. None of the males were soft shells (Table 3). New shell percentages were 38 and 100 for legals and sublegals, respectively (Table 4). The size range of the males was 153 - 187 mm, averaging 171 mm (Table 5). Of the 13 females, none were ovigerous or soft-shelled (Table 6).

Tanner crab catch in the July survey totalled 13 males and 22 females. Thirteen males and 5 females were caught in August. No king crabs of either sex were captured (Table 7).

Escape rings

This is the second year that retention of male Dungeness in pots with escape rings closed was compared to retention in pots with rings open. In 1993 the data clearly indicated that retention in pots with rings closed was substantially greater for sublegals and virtually the same for legals. In 1994 however the data indicated no significant difference between ring configuration for either sublegals or legals. Overall sublegal catch per pot was 0.4 for both closed and open rings. Catch rates for legal crabs was nearly identical in both ring open and ring closed pots at 0.8 and 0.7 crabs per pot, respectively. The explanation for the similar sublegal catches between ring configurations in 1994 likely lies in the small quantity of crabs captured therefore not providing sufficient numbers to show a difference (Table 8).

1994 trawl survey

The trawl survey was conducted June 27 through July 6, 1994. Male and female Dungeness catches from the 1994 trawl survey were 37 and 114 crabs, respectively (Table 9). Legals accounted for 68 percent (25 crabs) of males. New shells equalled 59 percent of the males and 38 percent of the females. Three percent of the total male catch were soft shells. None of the females were in a soft-shell condition. All of the females were non-ovigerous. Mean carapace width for males was 167 mm with a range of 131 to 187 mm (Figure 7). Mean carapace width of females was 145 mm within a range of 128 to 166 mm (Figure 8).

DISCUSSION

The 1994 pot survey data demonstrated a continuing decline in the catchable portion of the Dungeness stock. All sizes and shell ages of males caught in the survey east of Homer Spit were down considerably from the comparable monthly survey catches in 1991 through 1993 (Table 4 and Figure 9). The decline in crab numbers is likely explained by a combination of two factors:

1) The large size group of crabs that the surveys have tracked for the past 3 years is beginning to die of old age and relatively few adult crabs are available to take its place.

2) The recreational harvest was much larger than suspected. This was due to poor catch reporting and regulatory violation such as size, sex and bag limit restrictions. The August surveys in 1993 and 1994 showed a decline in crabs from the survey stations near Homer Spit where the majority of the

recreational fishery occurs; upper bay stations, where there is very little recreational effort, accounted for the bulk of the survey catches. The recreational fishery opened July 15.

Survey catches west of Homer Spit continued to be very low. Neither the pot nor trawl survey signified any potential for near term stock recovery. Personal use fisherman also reported very few Dungeness west of the Spit.

The pot survey did not identify a large percentage of soft shells again in 1994. The percentages were comparable to the proportions found in the 1990 through 1993 surveys (Table 3).

For the first time the trawl survey did not yield a significant percentage of softshells. This was due to both the small size and the old age structure of the sampled population, which in turn were the results of an increasing rate of natural mortality from old age, recreational fishing mortality, and weak succeeding year classes (Table 10).

Some data were collected in 1994 that may signify a stock recovery. Molted exoskeletons collected by the department from June through September of 1994 on the west side of Homer Spit indicated that a substantial size group of immature crabs are moving up in the stock. The size range of molted carapaces collected over the summer was 22 to 109 mm with a mean of 55 mm (Figure 10). Although these data cannot be quantified into an estimate of abundance, no meaningful numbers of molted exoskeletons have been found on the beaches of Kachemak Bay since 1990 when the group of crabs now passing through the latter stages of its life cycle in the waters east of the Spit first reached sexually maturity.

The department also collected newly molted crabs in September of 1994 from the Homer harbor using ring nets. The size range of

these crabs was 75 to 163 mm with an average width of 109 mm (Figure 11). These live animals were likely the product of the aforementioned exoskeletons. These and the exoskeleton data will be fully documented in another Regional Information Report.

The overall recovery of the Cook Inlet Dungeness crab population seems to hinge on the vagaries of nature and the reproductive success of the stock of crabs east of Homer Spit, which are now passing through the latter stages of their life cycle. Some evidence of this success has appeared in the abovementioned shell collection and ring net data. Furthermore the larvae from these animals may have been carried into all the waters of Cook Inlet. Research on Dungeness larval distribution along the Pacific coast indicates that larvae may be transported 100 miles or more.

The Dungeness pot and trawl surveys are scheduled again for 1995. No significant changes are planned for the survey designs. A groundfish trawl survey in the waters of Central Cook Inlet will occur in 1995 for the first time. The resultant data may provide additional insight into the distribution of Dungeness crabs in Cook Inlet.

LITERATURE CITED

Alaska Department of Fish and Game. Marine and Coastal Habitat Management Project. Resource Report for Cook Inlet Sale No. 670. 1978. Oct. Anchorage.

McConnaughey, R.A., D.A. Armstrong, B.M. Hickey, and D.R. Gunderson. 1992. Juvenile Dungeness crab (Cancer magister) recruitment variability and oceanic transport during the plagic larval phase. Can. J. Fish. Aquat. Sci. 49:2028-2044.

Jamieson, G.S., and A. Phillips. 1993. Megalopal spatial distribution and stock separation in Dungeness crab (Cancer magister). Can. J. Fish. Aquat. Sci. 50:416-429.

Table 1. Dungeness crab catch by year, Cook Inlet Management Area, 1961–1994.

Year	Southern district catch (lbs.)	Other districts catch (lbs.)	Total catch (lbs.)	No. of vessels	No. of landings
1961	193,683	0	193,683	12	189
1962	530,770	0	530,770	15	269
1963	1,665,599	11,605	1,677,204	50	1,360
1964	417,005	6,036	423,041	22	341
1965	74,211	0	74,211	14	105
1966	12,523	117,037	129,560	5	28
1967	7,168	0	7,168	2	13
1968	484,452	3,407	487,859	7	224
1969	49,894	0	49,894	9	41
1970	209,819	0	209,819	10	50
1971	97,161	0	97,161	22	136
1972	38,930	0	38,930	24	206
1973	308,777	1,271	310,048	54	625
1974	718,729	2,514	721,243	38	619
1975	361,893	922	362,815	34	402
1976	118,903	395	119,298	19	123
1977	74,195	510	74,705	18	94
1978	1,212,571	3,208	1,215,779	49	668
1979	2,130,963	0	2,130,963	72	1,485
1980	1,875,281	0	1,875,281	54	1,183
1981	1,850,977	0	1,850,977	88	2,047
1982	818,380	505	818,885	108	2,310
1983	746,585	834	747,419	71	1,194
1984	799,638	570	800,208	102	1,687
1985	1,389,891	12,511	1,402,402	106	1,768
1986	550,968	12,894	563,862	83	1,069
1987	761,423	21,753	783,176	100	1,377
1988	677,334	41,941	719,275	84	1,305
1989	170,266	7,798	178,064	43	455
1990	28,938	564	29,502	23	112
1991	Season closed	0	0	0	0
1992	Season closed	Confidential [1]	Confidential [1]		
1993	Season closed	Confidential [1]	Confidential [1]		
1994	Season closed	Confidential [1]	Confidential [1]		

Note: Average catch 1978–1990 = 1.01 million pounds per year.

1 Two or less participants.

Table 2. Station descriptive data, Kachemak Bay Dungeness crab pot survey, 1994.

Date[1]	Location	Station	No. pots pulled	Depth[2] range (fms)	Avg. (fms)	Avg. soak (hrs.)
5/23	East of Spit	Upper Bay	45	1.3–5.2	2.5	25
5/24		Mud Bay	45	3.5–10.3	5.6	21
6/21		Mud Bay	45	1.7–9.0	3.6	24
6/22		Upper Bay	45	3.0–6.2	4.2	23
7/19		Upper Bay	45	2.7–6.3	3.9	24
7/20		Mud Bay	45	2.7–8.2	5.0	21
8/22		Mud Bay	44	2.2–8.7	3.8	26
8/23		Upper Bay	44	0.7–5.2	1.7	22
7/12	West of Spit		70	16.0–44.0	29.2	49
8/16			77	15.0–46.0	29.4	48

1 Date gear was set.
2 Depths calculated from vessels sounder at time gear was set. Not calculated from mean lower low water as used on navigational charts.

Table 3. Dungeness crab catch, in numbers, Southern District Dungeness pot surveys, 1990–94.

Year	Dates	Location	Pots pulled	Females	Sublegal males	Legal males	Total males	Soft–shell males
1990	5/15–17	East of Spit	90	53	47	17	64	8 (13)
	6/19–21		90	54	65	23	88	9 (10)
1991	6/04–06	East of Spit	89	6	116	110	226	21 (9)
	7/09–11		90	21	388	263	651	36 (6)
	8/06–08		90	85	625	475	1,100	47 (4)
	9/12–14		90	30	615	492	1,107	5 (<1)
	7/02–06	West of Spit	82	9	6	5	11	2 (18)
	8/14–16		95	9	7	11	18	0 (0)
1992[1]	5/31–6/04	East of Spit	89	27	276	180	456	2 (1)
	6/30–7/2		89	76	583	578	1.161	31 (3)
	7/27–29		90	65	621	531	1.152	50 (4)
	8/11–13		90	47	849	792	1,641	14 (1)
	8/25–27		88	47	853	737	1,590	24 (2)
	9/10–12		89	47	621	749	1,370	4 (<1)
	10/07–09		90	19	516	349	865	2 (<1)
	7/05–07	West of Spit	96	30	7	14	21	1 (5)
	8/05–07		78	59	49	59	108	0
1993[1]	5/17–19	East of Spit	90	18	105	120	225	2 (1)
	6/15–17		90	60	226	203	429	5 (1)
	7/20–22		90	95	297	448	745	25 (3)
	8/16–23		90	84	352	555	907	35 (4)
	9/22–24		86	78	148	280	428	5 (1)
	7/13–15	West of Spit	70	11	6	3	9	0
	8/09–11		80	25	9	34	43	0
1994[1]	5/23–25	East of Spit	90	18	9	7	16	1 (6)
	6/21–23		90	119	28	48	76	0
	7/19–21		90	113	39	93	132	0
	8/22–24		88	37	58	119	177	3 (2)
	7/12–14	West of Spit	70	17	0	3	3	0
	8/16–18		77	13	3	8	11	0

1 33% of escape rings closed, 1992–94.

Table 4. Shell age of male Dungeness crabs from the Southern District Dungeness pot survey, 1990–94.

			Shell age													
			Number sublegals					Number legal					All males				
Year	Dates	Location	New	(%)	Old	(%)	Total	New	(%)	Old	(%)	Total	New	(%)	Old	(%)	Total
1990	5/15–5/17	East of Spit	30	(64)	17	(36)	47	7	(41)	10	(59)	17	37	(58)	27	(42)	64
	6/19–6/21		52	(80)	13	(20)	65	17	(74)	6	(26)	23	69	(78)	19	(22)	88
1991	6/04–6/06	East of Spit	89	(77)	27	(23)	116	101	(92)	9	(8)	110	190	(84)	36	(16)	226
	7/09–7/11		368	(95)	20	(5)	388	262	(99)	1	(1)	263	630	(97)	21	(3)	651
	8/06–8/08		607	(97)	18	(3)	625	470	(99)	5	(1)	475	1,077	(98)	23	(2)	1,100
	9/12–9/14		596	(97)	19	(3)	615	486	(99)	6	(1)	492	1,082	(98)	25	(2)	1,107
1991	7/02–7/06	West of Spit	2	(33)	4	(67)	6	4	(80)	1	(20)	5	6	(55)	5	(45)	11
	8/14–8/16		6	(86)	1	(14)	7	7	(64)	4	(36)	11	13	(72)	5	(28)	18
1992	5/31–6/02	East of Spit	37	(13)	239	(87)	276	44	(24)	136	(76)	180	81	(18)	375	(82)	456
	6/30–7/02		153	(26)	430	(74)	583	261	(45)	317	(55)	578	414	(38)	747	(62)	1,161
	7/27–7/29		210	(34)	411	(66)	621	268	(51)	263	(49)	531	478	(41)	674	(59)	1,152
	8/11–8/13		272	(32)	577	(68)	849	328	(41)	464	(59)	792	600	(37)	1,041	(53)	1,641
	8/25–8/27		363	(43)	490	(57)	853	430	(58)	307	(42)	737	793	(50)	797	(50)	1,590
	9/10–9/12		254	(41)	367	(59)	621	436	(58)	313	(42)	749	690	(50)	680	(50)	1,370
	10/07–10/09		171	(49)	178	(51)	349	375	(73)	141	(27)	516	546	(63)	319	(37)	864
	7/05–7/07	West of Spit	3	(43)	4	(57)	7	5	(36)	9	(64)	14	8	(38)	13	(62)	21
	8/05–8/07		33	(67)	16	(33)	49	40	(68)	19	(32)	59	73	(68)	35	(32)	108
1993[1]	5/15–5/19	East of Spit	7	(7)	98	(93)	105	28	(23)	92	(77)	120	35	(16)	190	(84)	225
	6/15–6/17		22	(10)	204	(90)	226	43	(21)	160	(79)	203	65	(15)	364	(85)	429
	7/20–7/22		95	(32)	202	(68)	297	208	(46)	240	(54)	448	303	(41)	442	(59)	745
	8/16–8/23		154	(44)	198	(56)	352	306	(55)	249	(45)	555	460	(51)	447	(49)	907
	9/22–9/24		52	(35)	96	(65)	148	132	(47)	148	(53)	280	184	(43)	244	(57)	428
1993[1]	7/13–7/15	West of Spit	3	(50)	3	(50)	6	1	(33)	2	(66)	3	4	(44)	5	(56)	9
	8/09–8/11		3	(33)	6	(66)	9	23	(68)	11	(32)	34	26	(60)	17	(40)	43
1994[1]	5/23–5/25	East of Spit	1	(11)	8	(89)	9	0		7	(100)	7	1	(6)	15	(94)	16
	6/21–6/23		5	(18)	23	(82)	28	11	(23)	37	(77)	48	16	(21)	60	(79)	76
	7/19–7/21		18	(46)	21	(54)	39	33	(35)	60	(65)	93	51	(39)	81	(61)	132
	8/22–8/24		32	(55)	26	(45)	58	73	(61)	46	(39)	119	105	(59)	72	(41)	177
	7/12–7/14	West of Spit					0			3	(100)	3	0		3	(100)	3
	8/16–8/18		0	(0)	3	(100)	3	3	(38)	5	(62)	8	3	(27)	8	(73)	11

1 33% of escape rings closed.

Table 5. Male Dungeness crab size data, Southern District Dungeness pot surveys, 1990–94.

Year	Date	Location	Average width (mm)	Range
1990	5/15–5/17	East of Spit	155	101–190
	6/19–6/21		154	102–189
1991	6/04–6/06	East of Spit	164	135–187
	7/09–7/11		163	114–182
	8/06–8/08		164	129–185
	9/12–9/14		164	127–189
	7/02–7/06	West of Spit	164	158–174
	8/14–8/16		172	158–197
1992	5/31–6/02	East of Spit	163	136–190
	6/30–7/02		165	137–191
	7/27–7/29		165	139–194
	8/11–8/13		165	142–196
	8/25–8/27		164	126–194
	9/10–9/12		166	139–193
	10/7–10/9		167	139–192
	7/05–7/07	West of Spit	171	156–202
	8/05–8/07		167	145–204
1993	5/17–5/19	East of Spit	166	144–189
	6/15–6/17		165	143–195
	7/20–7/22		167	148–193
	8/16–8/23		168	146–190
	9/22–9/24		168	145–192
		West of Spit		
	7/13–7/15		164	156–180
	8/09–8/11		170	153–186
1994	5/23–5/25	East of Spit	162	129–180
	6/21–6/23		168	152–192
	7/19–7/22		169	153–187
	8/22–8/24		168	100–197
	7/12–7/14	West of Spit	169	166–173
	8/16–8/18		171	153–187

Table 6. Female Dungeness crab catch, Southern District Dungeness pot surveys, 1990–94.

Year	Dates	Location	Total females	Egg development (No.) w/eggs	Egg development (No.) w/o eggs[1]	Avg. size (mm)	Size range	Soft-shells (no.)	Shellage (no.) new	Shellage (no.) old
1990	5/15–5/17	East of Spit	53	3	50	149	113–165	6	45	8
	6/19–6/21		54	0	54	153	106–171	8	44	10
1991	6/04–6/06	East of Spit	6	0	6	152	120–163	0	4	2
	7/09–7/11		21	2	19	149	119–165	0	16	5
	8/06–8/08		85	0	85	150	116–173	0	66	19
	912–9/14		30	0	30	149	128–170	0	23	7
	7/02–7/06	West of Spit	9	0	9	155	135–163	0	3	6
	8/14–8/16		9	0	9	155	148–175	0	9	0
1992	5/31–6/02	East of Spit	27	2	25	143	126–164	0	14	13
	6/30–7/02		76	0	76	145	126–164	0	32	44
	7/27–7/29		652	0	65	144	115–172	0	32	33
	8/11–8/13		47	0	47	148	126–170	0	19	28
	8/25–8/27		47	0	47	145	126–167	0	16	31
	9/10–9/12		47	0	47	143	129–171	0	30	17
	10/7–10/9		19	0	19	147	126–169	2	10	9
	7/05–7/07	West of Spit	30	0	30	154	139–168	1	20	10
	8/05–8/07		59	0	59	156	141–167	0	50	9
1993	5/17–5/19	East of Spit	18	1	17	151	136–169	0	16	2
	6/15–6/17		60	0	60	142	123–158	0	40	20
	7/20–7/22		95	0	95	146	125–175	0	27	68
	8/16–8/23		84	1	83	146	128–165	0	29	55
	9/22–9/24		78	0	78	146	129–160	3	22	53
	7/13–7/15	West of Spit	11	0	11	151	139–165	0	7	4
	8/09–8/11		25	0	25	156	141–168	0	19	6

– Continued –

Table 6. Continued.

Year	Dates	Location	Total females	Egg development (No.) w/eggs	Egg development (No.) w/o eggs[1]	Avg. size (mm)	Size range	Soft-shells (no.)	Shellage (no.) new	Shellage (no.) old
1994	5/23–5/25	East of spit	18	0	18	138	72–154	1	3	15
	6/21–6/23		119	0	119	147	118–181	1	10	109
	7/19–7/21		113	0	113	143	123–169	0	16	97
	8/22–8/24		37	0	37	149	133–164	1	4	33
	7/12–7/14	West of Spit	17	0	17	152	138–163	0	15	2
	8/16–8/18		13	0	13	153	137–169	0	11	2

1 Barren adults not distinguished from juveniles.

Table 7. Tanner and king crab bycatch from the Southern District Dungeness crab pot survey, 1990–1994.

Year	Dates	Location	Tanner crabs		King crabs	
			males	females	males	females
1990	5/15–5/17	East of Spit	1	0	0	0
	6/19–6/21		0	1	0	0
1991	6/04–6/06	East of Spit	101	14	2	2
	7/09–7/11		8	0	0	0
	8/06–8/08		13	0	0	0
	9/12–9/14		2	0	0	0
1991	7/02–7/06	West of Spit	76	31	0	0
	8/14–8/16		33	29	0	0
1992	5/31–6/02	East of spit	21	0	0	0
	6/30–7/02		0	0	0	0
	7/27–7/29		0	0	0	0
	8/11–8/13		0	0	0	0
	8/25–8/27		0	0	0	0
	9/10–9/12		0	0	0	0
	10/7–10/9		0	0	0	0
	7/05–7/07	West of Spit	35	4	0	0
	8/05–8/07		40	4	0	0
1993	5/17–5/19	East of Spit	1	0	0	0
	6/15–6/17		0	0	0	0
	7/20–7/22		0	0	0	0
	8/16–8/23		0	0	0	0
	9/22–9/24		0	0	0	0
	7/13–7/15	West of Spit	27	17	0	0
	8/09–8/11		32	33	0	0
1994	5/23–5/25	East of Spit	0	0	0	0
	6/21–6/23		0	0	0	0
	7/19–7/21		0	0	0	0
	8/22–8/24		0	0	0	0
	7/12–7/14	West of Spit	13	22	0	0
	8/16–8/18		13	5	0	0

Table 8. Average catch per pot of male Dungeness crab in pots with and without escape rings, east of Homer Spit, 1994 Southern District Dungeness crab pot survey.

Size (5 mm groups)	Rings Closed	Rings open
Sublegals		
<139	<0.1	0
140–144	0	0
145–149	0	0
150–154	<0.1	<0.1
155–159	0.1	0.1
160–164	0.2	0.3
Total sublegals	0.4	0.4
Legals		
165–169	0.2	0.3
170–174	0.2	0.3
175–179	0.2	0.2
180–184	<0.1	0.1
>185	<0.1	<0.1
Total legals	0.7	0.8

Table 9. Summary of Dungeness crab catch (number), Southern District crab trawl survey, 1989–94.

Date	Stations	Total Dungeness catch	Males	Average width (mm)	Range	Percent softshell	Females	Average width (mm)	Range	Percent softshell	Percent egg bearing
Oct., 1989	11	934	304	118	28–216	11	630	124	24–170	8	1
July, 1990	19	977	317	134	91–181	12	660	129	102–171	11	5
July, 1991	20	710	234	155	111–183	20	476	134	106–173	0	11
July, 1992	18	687	211	157	128–193	24	476	143	116–174	<1	<1
July, 1993	19	670	136	166	136–188	17	534	141	126–169	0	0
July, 1994	20	151	37	167	131–187	3	114	145	128–166	1	0

Table 10. Incidence of soft shelled Dungeness crabs, Southern District crab trawl survey, 1989–1994.

Date	Total males	No. soft	(%)	Legal males	No. soft	(%)	Sublegal males	No. soft	(%)	Females	No. soft	(%)
Oct., 1989	304	33	(11)	23	1	(4)	281	32	(11)	630	48	(8)
July, 1990	317	37	(12)	6	0		311	37	(12)	660	72	(11)
July, 1991	234	47	(20)	46	11	(24)	188	36	(19)	473	0	
July, 1992	211	51	(24)	66	27	(41)	145	24	(17)	476	1	
July, 1993	136	23	(17)	76	15	(20)	60	8	(13)	534	0	
July, 1994	37	1	(3)	25	1	(4)	12	0		114	0	

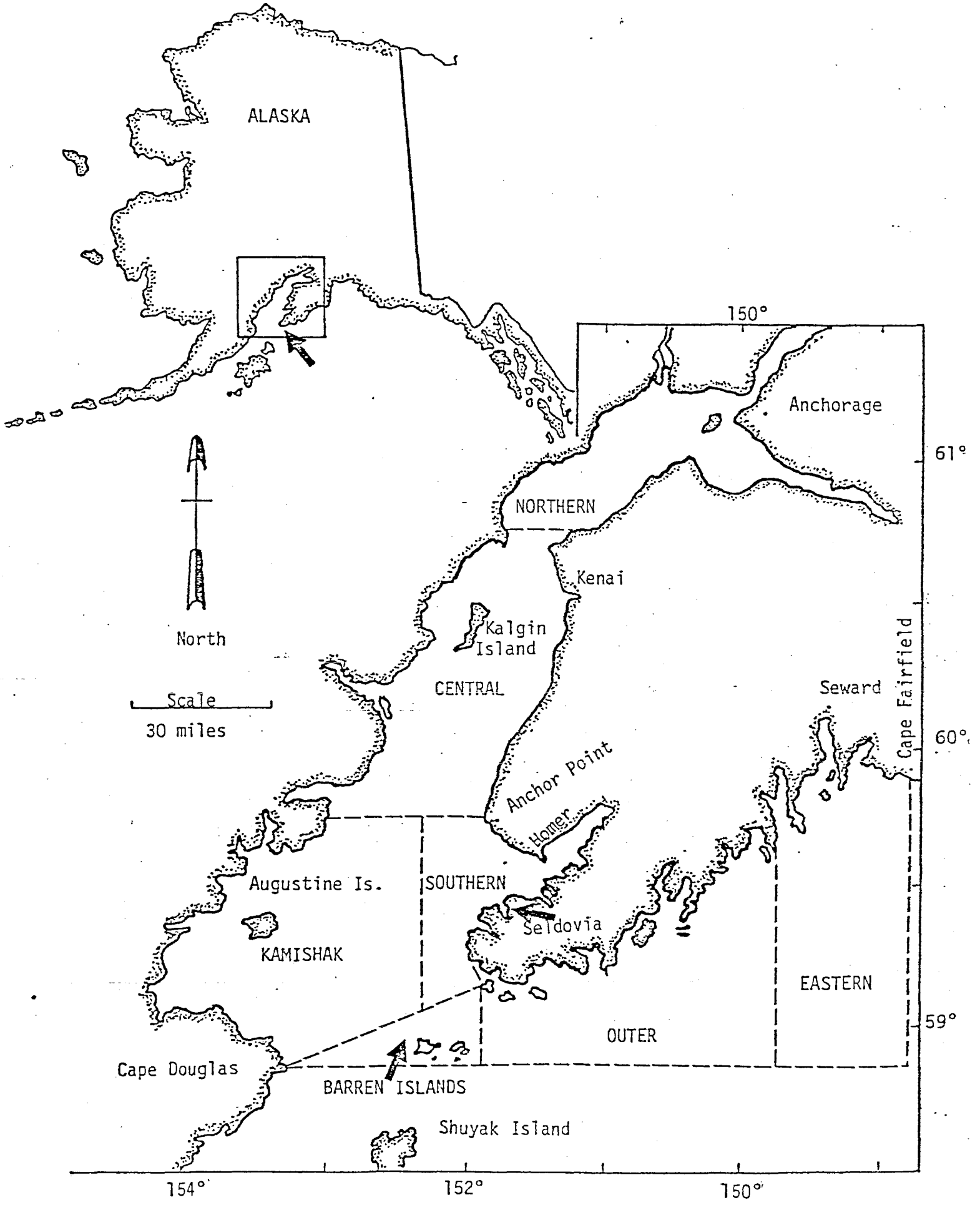


Figure 1 . Cook Inlet area district location chart.

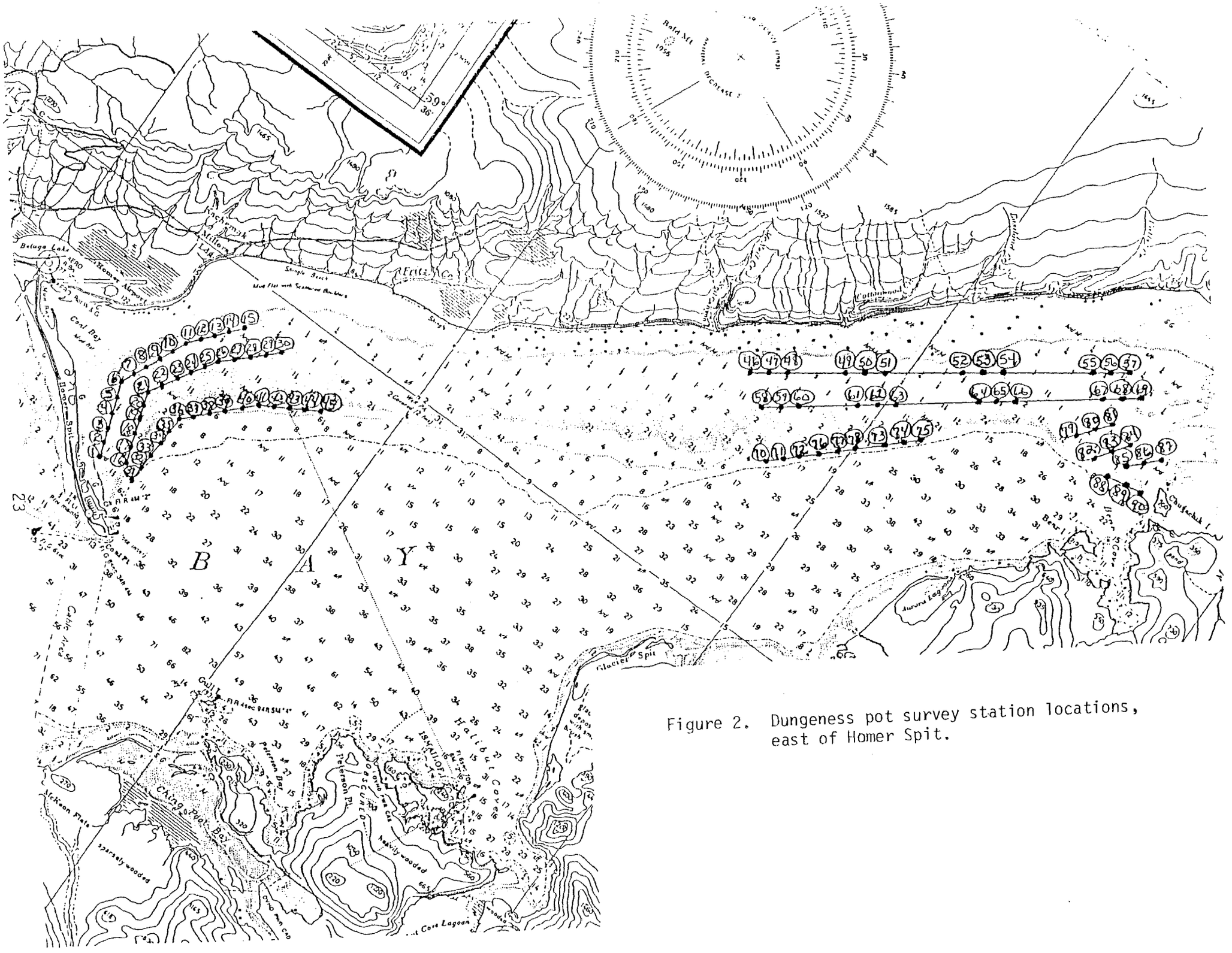


Figure 2. Dungeness pot survey station locations, east of Homer Spit.

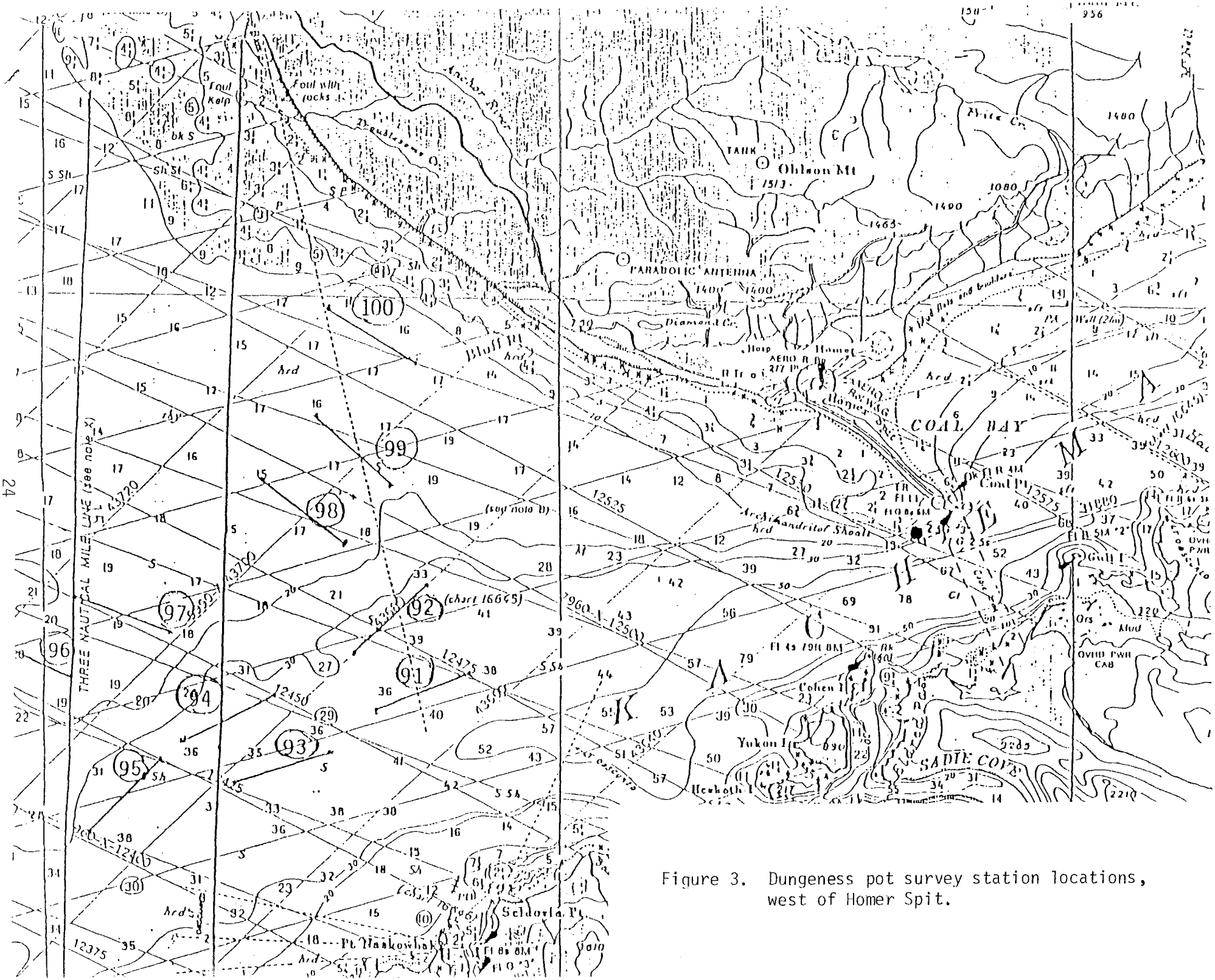


Figure 3. Dungeness pot survey station locations, west of Homer Spit.

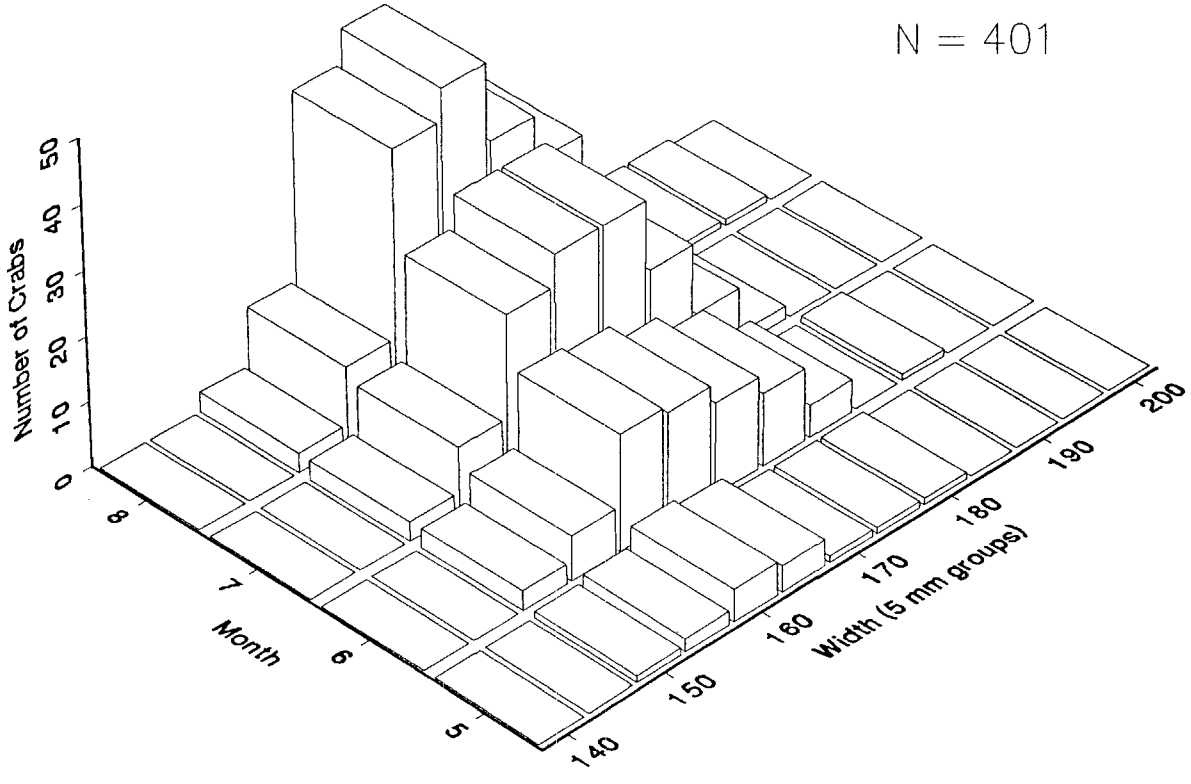


Figure 4. Total male Dungeness catch, May - Aug. 1994 Dungeness pot survey.

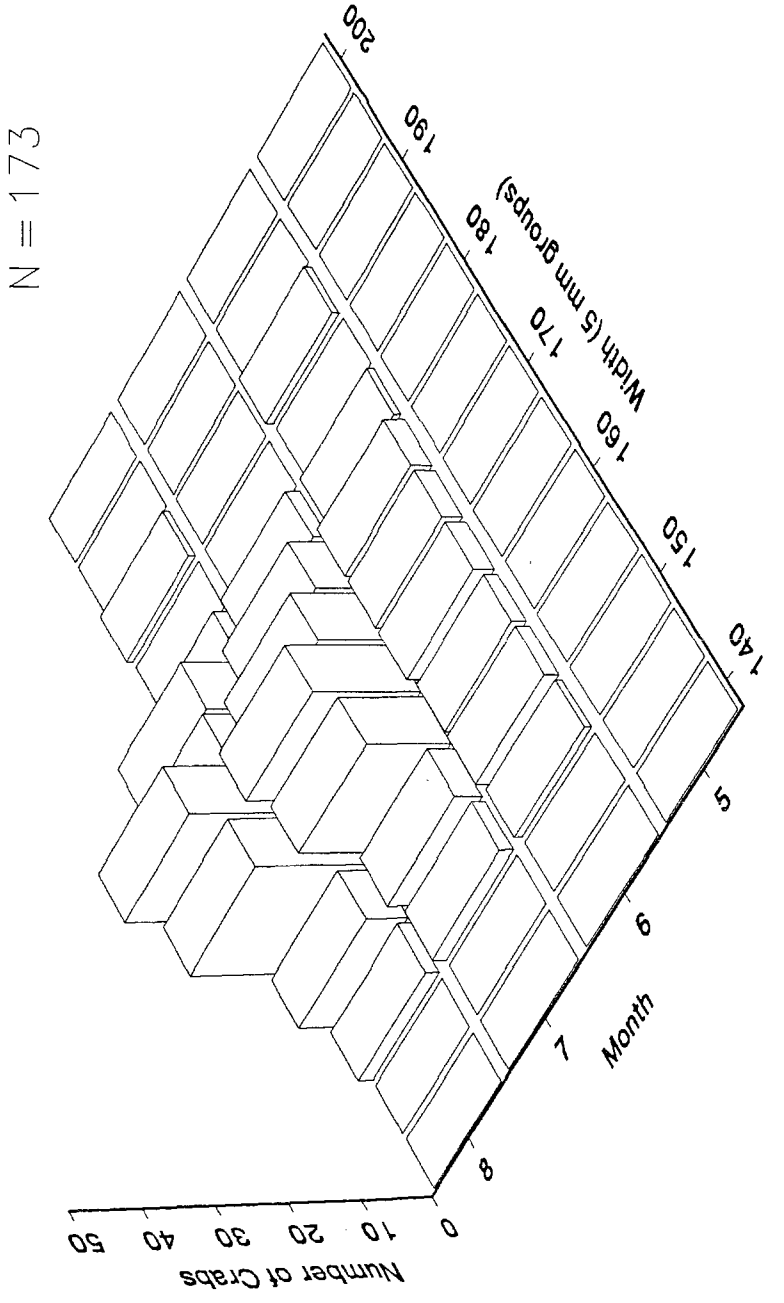


Figure 5. New shell male Dungeness catch, May - Aug., 1994 Dungeness pot survey.

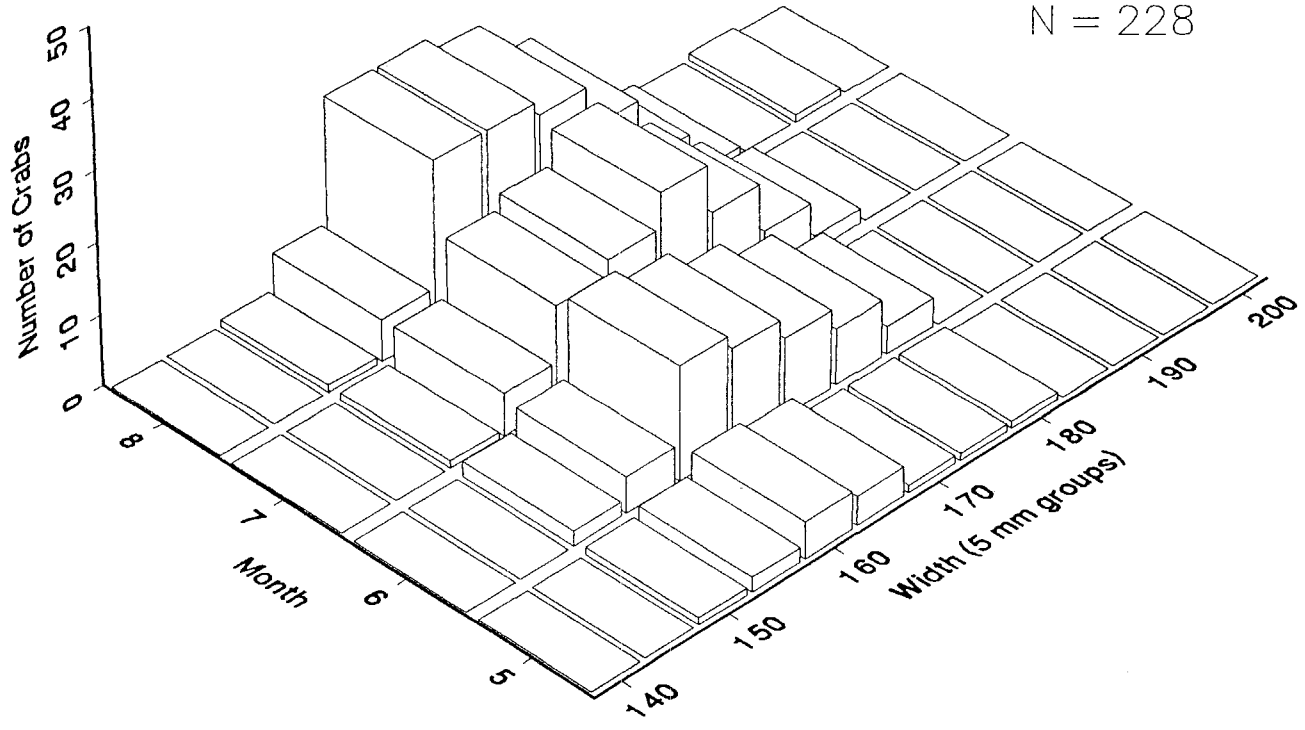


Figure 6. Old shell male Dungeness catch, May - Aug., 1994 Dungeness pot survey.

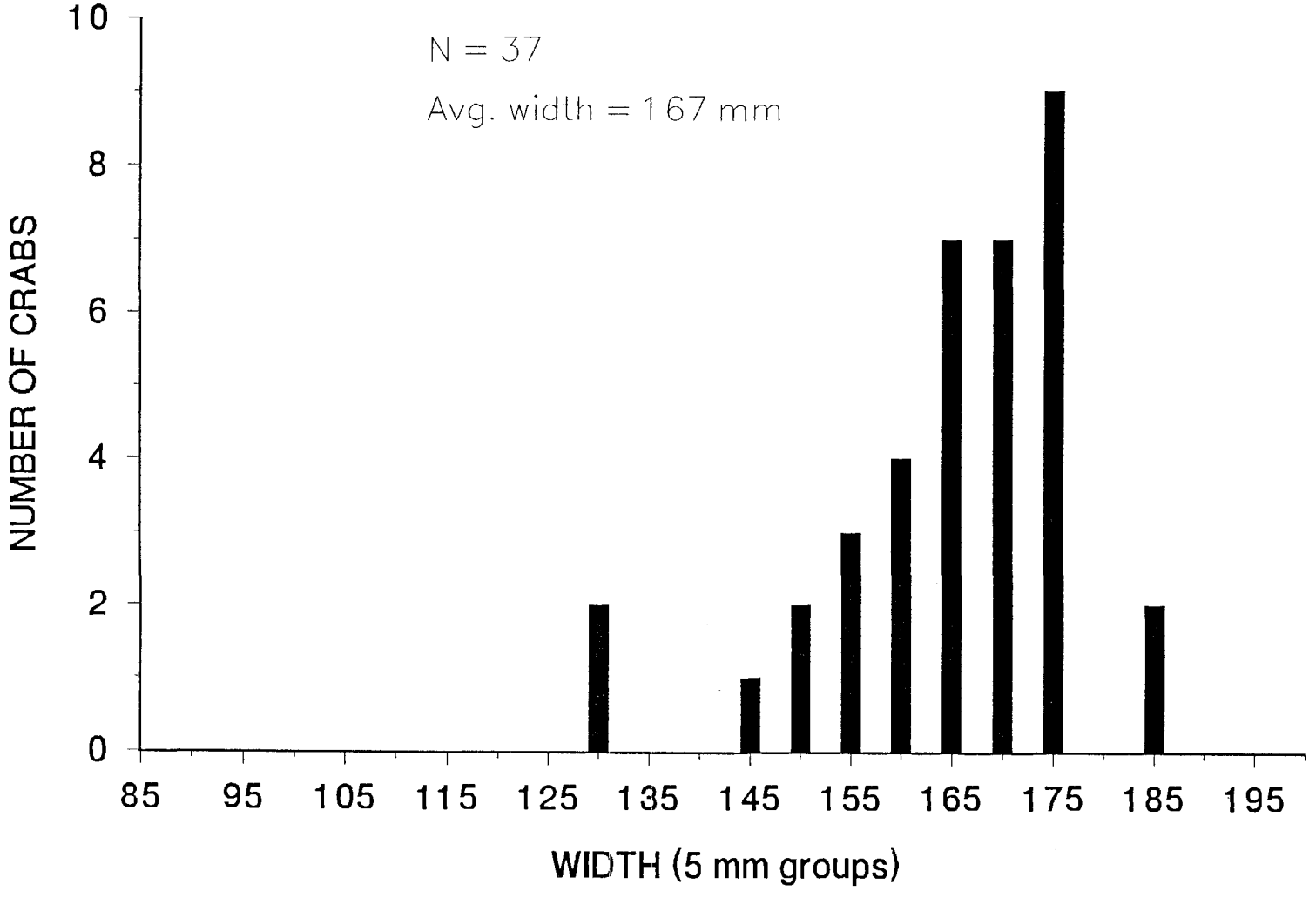


Figure 7. Male Dungeness catch, July, 1994 Southern Distr. crab trawl survey

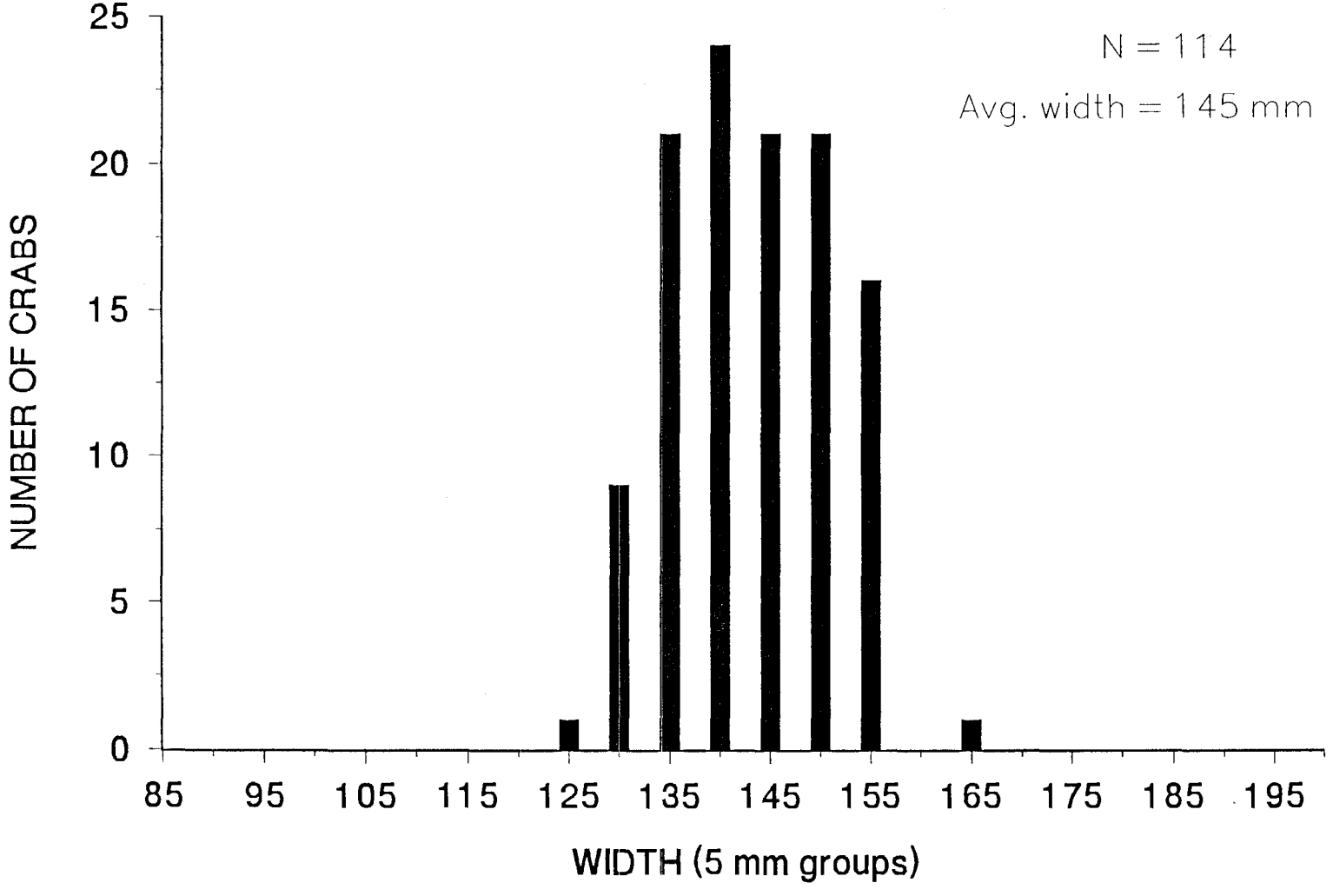


Figure 8. Female Dungeness catch, July, 1994 Southern Distr. crab trawl survey.

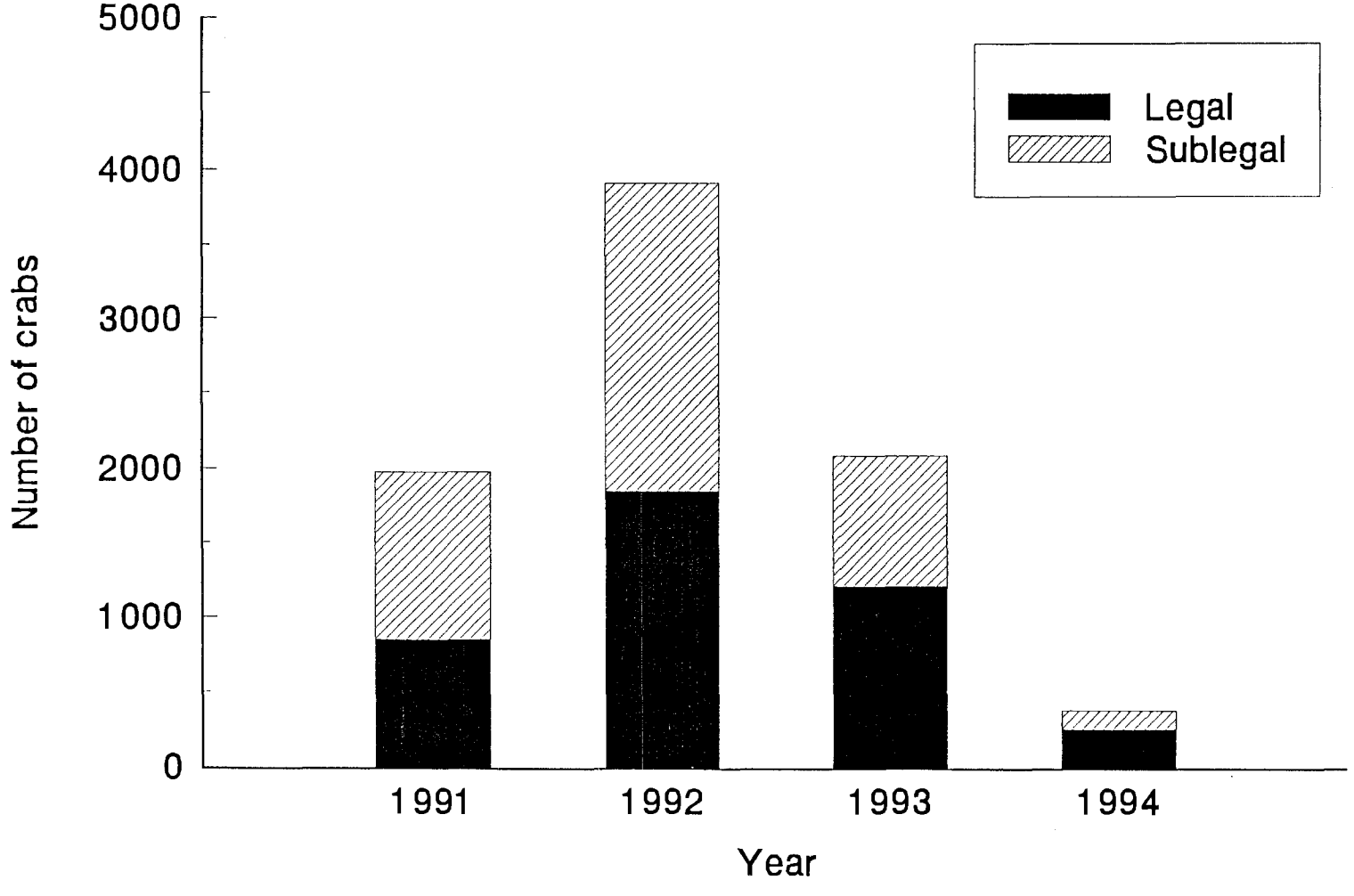
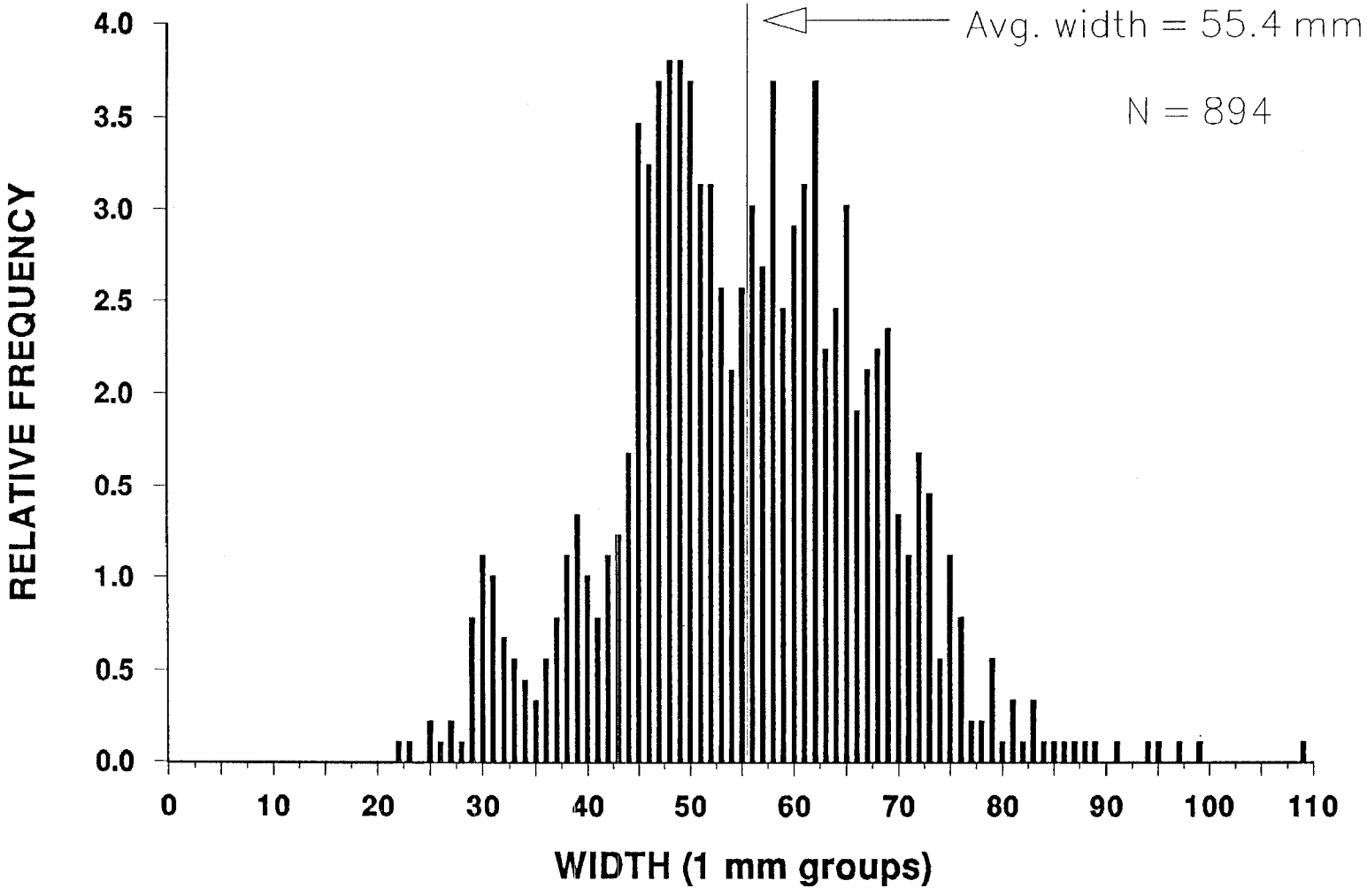


Figure 9. Male Dungeness catch, June through Aug. surveys, Kachemak Bay, east of Homer Spit, 1991 - 1994.



10. Dungeness exoskeletons collected from Homer Spit, 1994.

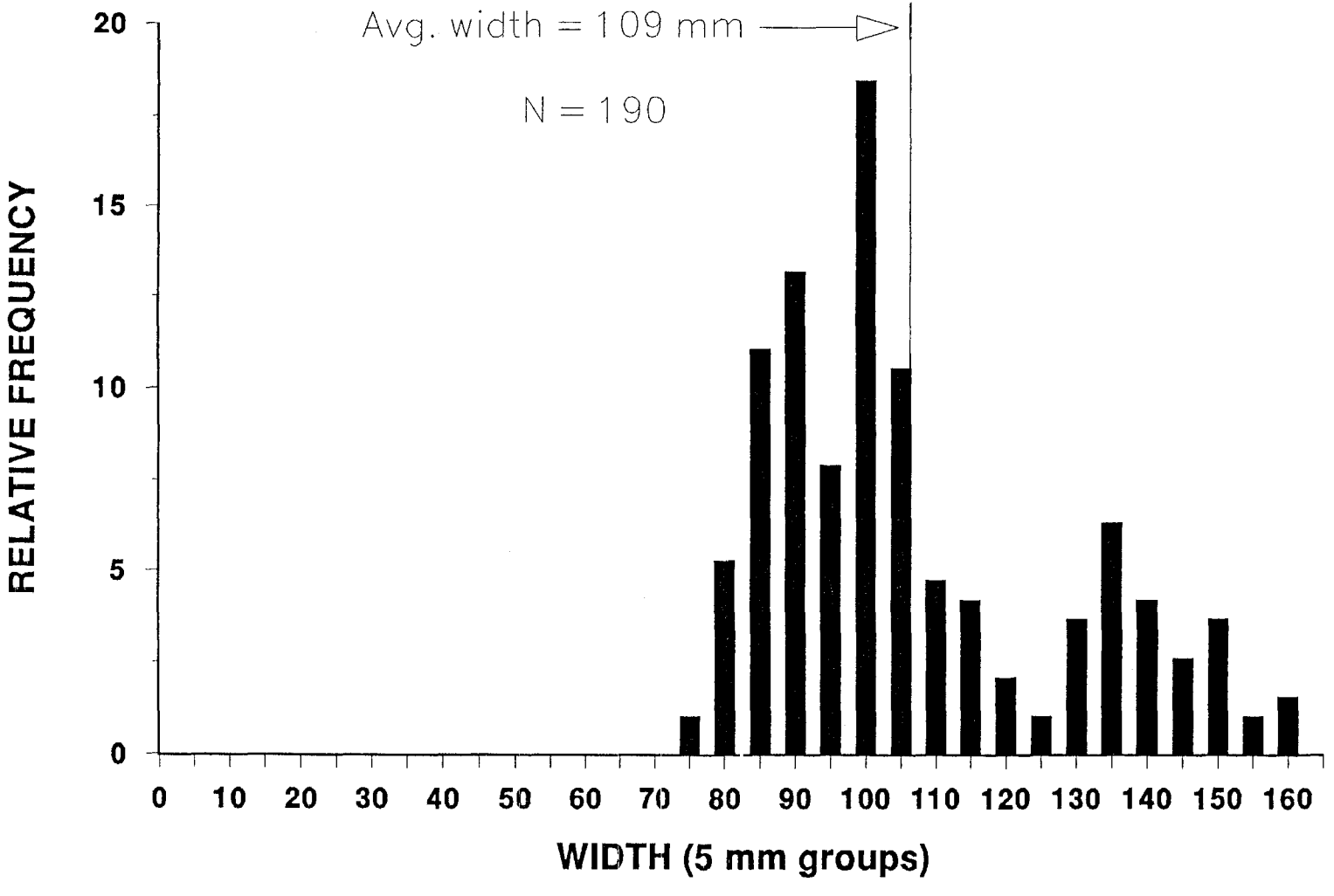


Figure 11. Dungeness crabs collected from Homer Boat Harbor, 1994.

Appendix A. Survey station locations, east of Homer Spit, Southern District Dungeness pot survey, 1994.

Station No.	Latitude	Longitude
1.	59° 36'.90	151° 25'.90
2.	59° 37'.15	151° 26'.10
3.	59° 37'.35	151° 26'.30
4.	59° 37'.60	151° 26'.50
5.	59° 37'.82	151° 26'.65
6.	59° 38'.06	151° 26'.50
7.	59° 38'.30	151° 26'.30
8.	59° 38'.52	151° 26'.10
9.	59° 38'.80	151° 25'.90
10.	59° 38'.92	151° 25'.52
11.	59° 39'.10	151° 25'.15
12.	59° 39'.28	151° 24'.75
13.	59° 39'.45	151° 24'.40
14.	59° 39'.60	151° 24'.00
15.	59° 39'.72	151° 23'.55
16.	59° 37'.03	151° 25'.39
17.	59° 37'.30	151° 25'.50
18.	59° 37'.52	151° 25'.62
19.	59° 37'.75	151° 25'.76
20.	59° 38'.03	151° 25'.95
21.	59° 38'.25	151° 25'.63
22.	59° 38'.43	151° 25'.39
23.	59° 38'.67	151° 25'.12
24.	59° 38'.89	151° 24'.78
25.	59° 39'.03	151° 24'.40
26.	59° 39'.18	151° 23'.98
27.	59° 39'.30	151° 23'.51
28.	59° 39'.45	151° 23'.11
29.	59° 39'.60	151° 22'.70
30.	59° 39'.73	151° 22'.26
31.	59° 36'.84	151° 25'.05
32.	59° 37'.07	151° 25'.00
33.	59° 37'.31	151° 24'.91
34.	59° 37'.57	151° 24'.82
35.	59° 37'.85	151° 24'.72
36.	59° 38'.10	151° 24'.35
37.	59° 38'.28	151° 23'.95
38.	59° 38'.47	151° 23'.57
39.	59° 38'.64	151° 23'.20
40.	59° 38'.80	151° 22'.70
41.	59° 38'.92	151° 22'.30
42.	59° 39'.08	151° 21'.80
43.	59° 39'.20	151° 21'.40
44.	59° 39'.32	151° 20'.96
45.	59° 39'.46	151° 20'.50

Appendix A. Continued.

Station No.	Latitude	Longitude
46.	59° 42'.78	151° 13'.35
47.	59° 42'.95	151° 12'.90
48.	59° 43'.11	151° 12'.45
49.	59° 43'.70	151° 10'.97
50.	59° 43'.87	151° 10'.51
51.	59° 44'.05	151° 10'.10
52.	59° 44'.58	151° 08'.70
53.	59° 44'.75	151° 08'.21
54.	59° 44'.92	151° 07'.80
55.	59° 45'.50	151° 06'.30
56.	59° 45'.67	151° 05'.89
57.	59° 45'.83	151° 05'.40
58.	59° 42'.55	151° 12'.55
59.	59° 42'.71	151° 12'.11
60.	59° 42'.88	151° 11'.70
61.	59° 43'.45	151° 10'.30
62.	59° 43'.62	151° 09'.86
63.	59° 43'.80	151° 09'.40
64.	59° 44'.38	151° 08'.00
65.	59° 44'.55	151° 07'.53
66.	59° 44'.72	151° 07'.10
67.	59° 45'.28	151° 05'.65
68.	59° 45'.45	151° 05'.23
69.	59° 45'.65	151° 04'.80
70.	59° 42'.15	151° 11'.90
71.	59° 42'.23	151° 11'.50
72.	59° 42'.40	151° 11'.24
73.	59° 43'.20	151° 09'.50
74.	59° 43'.35	151° 09'.35
75.	59° 43'.48	151° 08'.85
76.	59° 42'.53	151° 10'.78
77.	59° 42'.72	151° 10'.43
78.	59° 42'.92	151° 10'.04
79.	59° 44'.80	151° 05'.67
80.	59° 45'.02	151° 05'.20
81.	59° 45'.24	151° 04'.75

Appendix A. Continued.

Station No.	Latitude	Longitude
82.	59° 44'.62	151° 05'.10
83.	59° 44'.90	151° 04'.65
84.	59° 45'.13	151° 04'.25
85.	59° 44'.75	151° 04'.30
86.	59° 45'.00	151° 03'.90
87.	59° 45'.12	151° 03'.40
88.	59° 44'.72	151° 03'.80
89.	59° 44'.67	151° 03'.36
90.	59° 44'.72	151° 03'.10

Appendix B. Survey station locations, west of Homer Spit, Southern District Dungeness pot surveys, 1994.

Station No.[1]	Begin (lat., long.)	End (lat., long.)
91	59°32.55 151°43.50	59°31.90 151°47.10
92	59°34.40 151°45.15	59°33.00 151°48.00
93	59°31.00 151°48.80	59°30.40 151°52.70
94	59°32.20 151°51.00	59°31.20 151°54.60
97	59°33.35 151°55.00	59°34.05 151°58.80
98	59°35.10 151°48.30	59°36.35 151°51.50
99	59°36.30 151°46.50	59°37.70 151°49.40
100	59°38.75 151°45.50	59°39.75 151°48.90

[1] Ten pots were set equidistant apart in each station.

E.E.O. STATEMENT

The Alaska Department of Fish and Game operates all of its public programs and activities free from discrimination on the basis of race, religion, color, national origin, age, sex, or handicap. Because the department receives federal funding, any person who believes he or she has been discriminated against should write to:

O.E.O.
U.S. Department of Interior
Washington, DC 20240